OCR
Oxford Cambridge and RSA

GCSE

Design and Technology: Electronic and Control systems

General Certificate of Secondary Education **J301**

OCR Report to Centres June 2016

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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General Certificate of Secondary Education

Design and Technology: Electronic and Control Systems (J301)

OCR REPORT TO CENTRES

A511 Introduction to Designing and Making

General Comments:

This report provides an overview of the work seen in the Controlled Assessment Units A511 – 'Introduction to designing and making.' This report has been prepared by the Principal Moderator and Team Leaders covering the specification J301. It should be read in conjunction with the marking criteria for assessment - outlined in the specification.

Most Centres are familiar with the requirements of the controlled assessment and this year there were few problems in regard to completion of the appropriate assessment forms. However, some Centres needed reminding, to post the selected sample of work. When the sample of work has been selected, Centres have three days to send the work to the moderator.

Once again, the majority of centres are to be congratulated on the quality of the annotation, recorded on the work of individual candidates. Moderators of this subject appreciate the time and effort that teachers put into completing this task. However, the application of the mark scheme is far more consistent when teachers fully justify the awarding of marks. There should be a clear indication of why candidates deserve the mark.

Centres should take note of the Unit Specification, which clearly indicates that a 'best fit' approach should be utilised when marking work. Candidates work can be judged as basic, sound or high ability.
It is important that candidate responses, are concise and completely relevant, to the chosen theme.

The vast majority of the controlled assessment seen during the moderation process was relevant to a GCSE standard. However, Centres are reminded that in unit A511, a candidate needs to produce a prototype system, not a product. Candidates naturally assume that they are completing a 'project' There needs to be a greater emphasis on the control of the proposed system and specific reference to the manufacture of a 'prototype system' In this unit the production of a case or box does not gain credit and is not necessary.

A PCB or a mechanism, allows ample opportunity for candidates to suggest how the proposed system operates, listing and explaining the purpose of the input devices, how it is controlled and what is the effect of the output device(s). These features are unique to the specification.

Centres are reminded about the need for 'Designing' in the A511 unit. Candidates need to design their own circuit. Some Centres are presenting a limited number of similar circuits to candidates, who then all pick the same circuit to make, leading to identical outcomes.

Summary of useful tips:

- A511 requires the design and manufacture of a 'Prototype System' and must include the design of a CONTROL system for the prototype
- The portfolio work **only** needs to be seen during moderation. Centres are requested not to send any practical work with the portfolio. This includes actual PCB's stuck into the folder
- Work should be removed from heavy ring binders, be securely fastened together and presented so that pages can be turned without having to remove sheets from plastic wallets.
- Work should be clearly labelled with Centre number, name of candidate and candidate number.

- The theme and starting point should be clearly stated on the front of each portfolio or on the Controlled Assessment Cover Sheet (CCS), which includes a 'Task Title' box allowing space for the theme to be entered.

- Candidates should include **acknowledgements or a bibliography** in the portfolio.

- Candidates should include a minimum of two digital images/photographs of the final product, but there should be clear evidence of manufacture.

Important: Centres are to ensure that they make reference to the present Specification available on the OCR website (revised April 2012 version 1) when assessing candidate's work.

Themes Set

Candidates must select **one** of the thirteen published themes from the specification. Starting points linked to the theme may be modified to suit candidate and/or Centre circumstances. However, the theme itself must **not** be altered.

The themes most popular this series - for Unit A511 were 'Security' 'Sport' and 'Travel'
There were fewer Controlled Assessments using Mechanisms this year

Application of the Assessment Criteria

On the whole centres have interpreted the marking criteria well, applying the marks appropriately and fairly across all criteria areas. **However, it has been necessary, in some instances this series, to make adjustments, to bring candidate's marks in line with the agreed National Standard.** Where any adjustments have been made, this is as a result of misinterpretation of the marking criteria or a lack of evidence to justify the marks submitted.

Point to note: The Report to Centres is an important document where issues raised from moderation are highlighted and suggestions for improvement given. It is recommended that all staff responsible for the delivery of this specification read this document thoroughly. It is evident that some Centres are making the same errors despite previous advice/guidance.

Similarly, it is recommended to contact your Subject Specialist via the Contact Centre, or review the OCR CPD Hub www.cpdhub.ocr.org.uk in order to take advantage of the support that can be offered in delivering and marking this qualification.

Annotation of the Controlled Assessment Portfolio and Recording of Marks

On the whole, centres have recorded and totalled marks accurately this session, which is to be commended.

It is helpful to encourage candidates to organise the portfolios according to the criteria areas. This reduces the need to annotate the work itself and makes identifying marks during moderation easier and quicker. It was noticeable this series that candidates had presented their portfolio's with care and thought. Centres are to be commended for this practice.

A511 – Comments on Individual Criteria Areas:

Creativity

Most Centres used the set themes provided by OCR, to identify a suitable need and user group. Mind Map's and Mood Boards, quickly identify a suitable problem linked to a theme.

It is important that candidates do not produce a detailed Design Brief at this point, containing all the features of the 'Final Design' Some candidates list all components and features of the FINAL DESIGN – before actually designing the prototype system.

Centres are given clear advice on product analysis as part of the individual Centre report. A generic recognition of similar products should be followed by a comparison of products, preferably with a disassembly of an existing product.

It is disappointing to see some Centres ignoring previous reports, giving advice on this issue. Within a Controlled Assessment, there is little time to waste on irrelevant research gaining no credit.

Too many candidates failed to recognise the links between a quality product and the technology involved. It is essential in this unit to identify specific materials and specific technologies used in the manufacture and use of the product. Stating that a product is made from plastic or wood or metal, suggests a response of **basic ability**. It is evident that too many candidates fail to identify production methods and the control systems, used in existing products.

Successful candidates consider the sustainability of a product in detail. There were good examples of using the 6R's when considering sustainability. An 'eco-web' provides a graphic representation of the product but should be qualified with a list of conclusions. It is important that the consideration of sustainability is relevant to the product being analysed.

Similar to last year, conclusions to the research continue to be lacking in detail and are often completed as an 'afterthought'. The conclusions need to bring all of the research activity together and form the basis for producing a detailed and justified Design Specification.

Successful Candidates:

- *Choose a theme*
- *Create a 'mind map' to identify action points*
- *Clearly identify the needs of the user and explain the situation in which the prototype could be used.*
- *Conduct detailed research – considering the changes in existing products, identifying trends, identifying specific materials and identifying the technologies used*
- *Produce a comprehensive Design Brief and action plan for realising the brief*
- *Conduct further research using critical analysis of a product to evaluate function, user needs, consider specific material properties, sustainability, and product life cycle*
- *Make specific reference to an 'Eco-Web', considering the sustainability of a product in detail*
- *Make a summative evaluation of the research activity leading to conclusions which will help form a Design Specification and final list of User Needs*

Designing

It was good to see improvements in the Design Specifications, this year. Good Specification points should be justified and measurable. There should be clear evidence that the candidate has thought about controlling the proposed system.

Using bullet points (or numbers) are the easiest way of showing Specification points. Long 'essay type' narrative is not necessary and very difficult for candidates to evaluate when designing.

A simple justification of the Specification point can be made using the terms, 'because' or 'so that'

The specification should be used throughout the design process in this unit, to ensure that the design meets the needs of the user. Some candidates produced a design specification that was too prescriptive or too vague to help with the design development. The specification will **only** be used in the design section in this unit.

It is good to see most Centres using a Systems approach to starting the design process. This clearly shows a range of INPUT and OUTPUT devices. However, many candidates still fail to recognise or identify a range of controlling devices

Most candidates produce a range of ideas with detailed notes on the components used in each idea. A range of methods are used, including pencil drawings and the use of CAD programmes. In this section there should be clear evidence of how the design idea fits in with the need of the user. There should be clear evaluation linked to the Design Specification.

There was an increase in Candidates copying 'circuit designs' this year. Circuits were taken from the internet or school based resources and used as initial ideas. This is against the spirit of the subject, gains little credit and leads to issues of malpractice. Candidates can use library circuits for research but need to create their own ideas.

Design development continues to be one of the weaker aspects of the Unit. Most candidates undertake modelling to test their best idea. This is often a repeat of one idea to see if the circuit or mechanism works. Candidates should use this process to combine ideas, make modifications and suggest alternatives. Once again there should be reference to the need of the user and the Design Specification. There should be comments about the changes made to the original idea.

Candidates are expected to 'design' their own solution to a problem. Simply copying the ideas from the internet gains little credit. The class teacher plays an important role in ensuring that candidates have the opportunity to be creative – candidates should not be guided into a set design because it suits the centre resources.

It was good to see that most Candidates produced a final design following the modelling stage. Candidates should list the components and materials to be used in the Making stage.

Successful Candidates:

- *Produce a detailed, justified, measurable, Design Specification, for a prototype system **not** a Product. Please note that detailed does not mean a paragraph on each individual point.*
- *Create a range of ideas with written explanations of how and why each idea could work.*
- *Make specific reference to the needs of the user and the Specification.*
- *Select ideas for development and test these ideas to develop a final design using modelling.*
- *Modify original ideas to produce a final design for a prototype system.*
- *Show full details of the final design including materials, components and a consideration of size.*

Making

A detailed plan needs to be produced before the start of the making process. It was good to see that most candidates produced a plan. However, Candidates need to consider all stages of the manufacturing process including the soldering of individual components.

Generally, candidates produce high quality prototypes, either as a circuit or mechanism. Candidates are judged on the quality of the manufacturing.

Successful Candidates:

- *Produce a plan that includes specific reference to materials, processes, tools, equipment, health and safety and quality control. The plan should make reference to individual stages of production. 'I will populate the PCB' is too generic.*
- *Show evidence that they have selected and used tools and equipment to construct, assemble and finish a working prototype.*
- *Manufacture a working prototype system*
- *Use tools and equipment in a safe manner, producing accurate stages of manufacture.*
- *Emphasise the use of a control system for the prototype*

Solving Technical Problems

It was good to see clear evidence of solving problems this year. This section should enable candidates to comment on the making process and show how they adapted to difficulties as they arose. Where candidates merely copied ideas from previous work – there was little evidence of solving problems as the idea had previously been trialled and tested – penalising the candidate.

Successful Candidates:

- *Link this section to the production plan, clearly indicating how they solved problems as the prototype is manufactured*
- *Clearly show a SNAG page, highlighting the problems that occurred during manufacture of the prototype and giving clear evidence of how the problems were solved.*

Record Key Stages

This section seems to be improving each year and it was clear that most candidates enjoy recording the manufacture of the controlled assessment.

It is essential that when marking the controlled assessment, teachers fully check the authenticity of the work at all stages. Library photographs should be fully referenced.

A photo diary on its own with no commentary will not justify full marks.

The comments should relate to the individual project. It is important that the photographs are of sufficient quality to reflect the quality of work completed. When producing a PCB, the photographs should show evidence of the quality of soldering and construction of the control system.

The population of the PCB or assembly of a mechanism should be shown, stage by stage.

Successful Candidates:

- *Fully record all stages of manufacture, using photographs and notes. This includes evidence of producing a PCB and/or using CAD/CAM*
- *Record all stages of PCB or mechanism manufacture, including photographs of PCB population, stage by stage.*
- *Show clear evidence of the Final Prototype in use, with photographs which clearly show the quality of manufacture including soldering and assembly.*

Critical Evaluation

Most Centres now recognise that candidates should comment on the designing and making processes only - in this unit. It was good to see an overall improvement in the Critical Evaluation this year – with successful candidates commenting on their evidence of high quality prototypes, high quality soldering and clear indication that the prototypes fully function as intended.

Candidates do not need to evaluate the Design Specification in this unit. Despite repeated guidance on this issue, some candidates wasted valuable time - gaining no credit.

It is important that Centre's allocate appropriate time to this section of the unit and allow candidates to achieve the higher range of marks. Many Centre's produce unit A511 in year ten where there should be time to complete the Critical Evaluation in detail.

Simple testing is important to see if the system meets the original needs. Comments are then made for improvements in the system function; these are rarely completed in detail.

It would be useful if the Centre added teacher comments about the success of the system.

Most folios were well presented in a logical order and the majority of centres awarded the correct mark for Spelling, Punctuation and Grammar.

Successful Candidates:

- *Produce a critical evaluation of the making process, for the prototype system.*
- *Fully test the prototype and suggest improvements*
- *Present their work in a logical, structured format.*
- *Use the correct technical terms, using words accurately.*

A513 Making quality products

General Comments:

This report provides an overview of the work seen in the Controlled Assessment Units A513 – 'Making Quality Products' This report has been prepared by the Principal Moderator and Team Leaders covering the specification J301. It should be read in conjunction with the marking criteria for assessment - outlined in the specification.

Most centres submitted the appropriate paper work on time. The annotated summary sheets assist the moderation process, Thank You.

Centres are reminded that upon receiving notification of the selected sample, candidates work should be posted to the appropriate moderator, within three days of receiving the notification.

Generally, Unit A513 continues to be a successful Controlled Assessment. The majority of this unit is completed in year eleven when candidates have fully developed their designing and manufacturing skills. Centres are to be congratulated on the work shown for this unit.

There were fewer entries submitted through the Repository this year. Most centres provided work, completed on A3 or A4 paper. Centres are reminded that folders need to be bound appropriately with a cover sheet attached. Centres are also advised that using large, bulky, leather bound folders, makes life very difficult when dispatching work.

To ensure candidates are given the best opportunity to achieve success, it is important to provide clear evidence of the manufacturing process – with photographs being in focus and preferably in colour. In a number of paper folders, the photographs were too small, out of focus and lacking in detail.

When Centres submitted the controlled assessments on CDs or USBs the quality of work was much easier to see and assess. Showing fully functioning products, as a video clip, with short commentary on the success and failure of the products, is to be commended.

Similar to last year, it should be noted that some Centres are relying on library circuits, either school based or from internet software, leading to whole batches of very similar products. When this happens, it affects the creative aspect of the design process and candidates will not achieve the higher marks available. Too often, candidates simply use a bought circuit and/or case and the controlled assessment becomes an assembly exercise.

Summary of useful tips:

- Centres must ensure that candidates have the opportunity to 'Design and Make' a PRODUCT in this unit.
- The portfolio work **only,** needs to be seen during moderation. Centres are requested not to send any practical work with the portfolio. This includes the actual PCB's stuck into the folder.
- Work should be removed from heavy ring binders, be securely fastened together and presented so that pages can be turned without having to remove sheets from plastic wallets.
- Work should be clearly labelled with Centre number, name of candidate and candidate number.

- The theme and starting point should be clearly stated on the front of each portfolio or on the Controlled Assessment Cover Sheet (CCS), which includes a 'Task Title' box allowing space for the theme to be entered.

- Candidates should include **acknowledgements or a bibliography** in the portfolio.

- Candidates should include a **minimum** of two digital images/photographs of the final product but Centres are advised that there should be clear evidence of manufacture and photographs should show the full range of work carried out by candidates, including PCB/Mechanism manufacture together with the case/container.

Important: Centres are to ensure that they make reference to the present Specification available on the OCR website (revised April 2012 version 1) when assessing candidate's work.

Themes Set

Candidates must select **one** of the thirteen published themes from the specification. Starting points linked to the theme may be modified to suit candidate and/or Centre circumstances. However, the theme itself must **not** be altered.

The themes most popular this series - for Unit A513 were 'Timers' 'Alarms' and 'Lighting'
There were fewer Controlled Assessments using a mechanism this year

Application of the Assessment Criteria

On the whole centres have interpreted the marking criteria well, applying the marks appropriately and fairly across all criteria areas. **However, it has been necessary, in some instances this series, to make adjustments, to bring candidate's marks in line with the agreed National Standard.** Where any adjustments have been made, this is as a result of misinterpretation of the marking criteria or a lack of evidence to justify the marks submitted. It was evident this year that some candidates work was identical to other candidates in the sample.

Point to note: The Report to Centres is an important document where issues raised from moderation are highlighted and suggestions for improvement given. It is recommended that all staff responsible for the delivery of this specification read this document thoroughly. It is evident that some Centres are making the same errors despite previous advice/guidance.

Similarly, it is recommended to contact your Subject Specialist via the Contact Centre, or review the OCR CPD Hub www.cpdhub.ocr.org.uk in order to take advantage of the support that can be offered in delivering and marking this qualification.

Annotation of the Controlled Assessment Portfolio and Recording of Marks

On the whole, centres have recorded and totalled marks accurately this session, which is to be commended.

It is helpful to encourage candidates to organise the portfolios according to the criteria areas. This reduces the need to annotate the work itself and makes identifying marks during moderation easier and quicker. It was noticeable this series that candidates had presented their portfolio's with care and thought. Centres are to be commended for this practice.

A513– Comments on Individual Criteria Areas

Designing:
Using a mind map is the best way to start investigating the theme. Candidates are reminded that this section should be concise and 'padding out' this section will gain no more than four marks. In some Controlled Assessments seen this year, there was evidence that some Candidates had simply copied a mind map and manipulated the colour scheme. Each mind map should be relevant to the user and need.
There is no need to produce time consuming questionnaires or surveys, for this unit. Product analysis could be used as a starting point but does not need to be in the same detail as those produced for unit A511. Candidates could look at an existing product and use the information gained as a starting point for the system and case/structure.

The design brief should clearly identify the need and problem to be solved.

Information and data needed is about the problem, user and/or client group.

The majority of Controlled Assessments contained a detailed and fully justified Design Specification.

However, some candidates limit the designing section by being too prescriptive in the Design Specification – listing the materials and components to be used on the final design - before actually designing the product.
It is good to see that centres are using a system approach at the start of ideas, but centres must ensure that candidates then produce a range of full circuit ideas. Selection of designs/ideas is still poorly completed, where most reasons seem to be based on the ease of making the circuit or system, rather than consideration of the user. Some Centres limit the choices of Candidates work by providing pre-determined circuits and components which all candidates use.

Modelling, either on breadboard or virtually, via cad software, is used by the majority of candidates. However, the modelling is used to test whether or not the final idea works, rather than using modelling as a development tool to modify, change, and finalise the best design.

Candidates should be using modelling to develop and improve the initial ideas. Annotation should reflect the changes and modifications to be made.

The casing of a structure needs to be developed in the same way as the control system. There was good evidence of quality sketching with detailed annotation and reference to the Specification.
There was little evidence of candidates working out how the control devices would be placed on the case/container.

Selection showed little relation to the needs of the user and this continues to be a weakness amongst the majority of candidates. Some candidates produced very creative design ideas for cases and then reverted to a plain rectangular box because it was easier to cut out, by hand or by CAD/CAM.

Candidates who achieved highly, created innovative case/structures, together with creative circuits/mechanisms.

The use of CAD, continues to develop and candidates are to be congratulated on the presentation of case/structure/mechanism designs. It is good to see the direct connection to manufacture where centres use laser cutters or a CNC router/miller.

Where centres use bought in cases, it is important that candidates show in detail how the box is being used. Fixing of the PCB, battery and cable routing must feature in the design work.

It is important that the case and circuit fit together to form a completed product.

Many photographs of the completed products, clearly show that the PCB and its components fit the case. Full marks will not be awarded if there is no evidence of appropriate mounting and space allocation. The circuit components will have a very short life span if it is simply jammed into a box.

When there is a lack of evidence with regards to the use of components, relevant to the size of the case, the final product is incomplete and will not be awarded full marks. The final design should be shown, as the PCB mask or the mechanism layout, together with dimensioned details of the container or structure.

Most candidates produced the correct information to start manufacture.

Successful candidates:
Start from a THEME and identify a problem. This may include ergonomic data, illustrating the need and making reference to any important component/part

- *Produce a summary which brings out the main points which must be considered.*
- Clearly *state the function and performance of the product in the design brief*
- *Produces a list of Specification Points which are measurable and related to the user/client, enabling them to be used in the evaluation*
- *Appraise and develop creative ideas clearly linked to the specification and need*
- *select reasons based on user need. When modelling, the selected system is built and then improvements made to make it match the need of the user*
- *Finalise the control system and the structure with clear details for making the product.*

Making:
Most candidates produced plans, including detail of materials, equipment, health and safety, quality control and time.
Candidates should consider the whole product and composition of the system, the structure/container and the assembly. It was noted this year that some candidates refer to the soldering process in general – each stage of population should be thought out to ensure high quality of the PCB.

Candidates have been able to demonstrate good quality making, both in the control system and case/structure. In a small number of centres, the PCB was a pre-manufactured item used by every candidate. This approach is counter-productive and against the spirit of our subject.

When there is no evidence of the designing or modification of a circuit, candidates cannot be awarded full marks. Assembling a pre made kit, with perfectly drilled holes does not test the candidate(s) ability to manufacture a quality product. It is simply an assembly exercise. If candidates use pre-bought cases then these should be clearly adapted to solve the need. This could include marking out, drilling, adaptation of mounting devices and links to the control system.

Centres are reminded that candidates are awarded marks for producing PCB's. Candidates are judged on the quality of soldering including the number of scorch marks and use of wires to complete the circuit. Candidates can gain marks in the next section by suggesting how they solved problems during the manufacture, however, poorly designed and manufactured circuits, which clearly don't work, will not gain access to the higher marks available.

Solving Technical Problems
It is expected modifications and changes will be made during the making stages and these should be recorded in writing with reasons for the change. A photograph provides an instant snap shot of a problem as it occurs. This section can include much more than negative information. I repeat my comment from last year, that Centres must not assume because the

product is successful they can award the highest marks. Evidence must be presented to justify any mark given.

The use of a SNAG table or sheet is suitable. Most successful Candidates produced a SNAG sheet this year. Please note that too often a teacher awards full marks (six) when there is no evidence within the controlled assessment. Some teachers state that full marks were awarded because the candidates 'solved problems – throughout' There needs to be written or photographic evidence! Some candidates struggled to show how they solved technical problems because they used pre-made kits for a particular circuit therefore eliminating errors and penalising the candidate.

Record Key Stages

This section continues to improve and most candidates are proud to display images of how they made the product. Candidate labels should be more evident to ensure the images are unique. It is good to use library images for the start of the project when manufacturing a PCB, but care should be taken to show the real work of candidates when assembling the control system. Where centres link the recording with the production planning chart, care must be taken to ensure that planning and evaluation are completed separately, before and after making.

Successful candidates:

- *include a production planning chart which breaks down the stages of manufacturing the control system and the case or structure, then shows the assembly stages through to final testing. The chart records materials, equipment, quality control points and expected time*
- *use a range of construction methods, using their own skill for a high quality product*
- *make and record changes and modifications to ensure the product matches the needs of the user/client. The candidate records all the changes of both manufacture and any reworking that is necessary*
- *demonstrate solving technical problems with a written log*
- *record the key stages of manufacture, with a set of detailed pictures with comments of the stages, showing the testing with the product working, in an appropriate situation, linked to the user.*

Critical Evaluation

Most candidates use the design specification when looking at the final product. This comparison works well when the specification is written as measurable points for the performance of the product. Writing generic descriptions of performance makes evaluation more difficult and less effective.

Using members of the user group for testing the product can give good feedback when the group makes constructive comments.
Effective testing should be recorded to show the performance, and this is where the short video clips, mentioned above, are useful. When matching the product's outcome to the user need, real points of modification and improvement arise.

Successful candidates:

- *Write critical points when comparing the specification to the final product*
- *Test the final product and show clearly how the product works for the user group and brings out points where the prototype needs modifications and changes.*
- *Use sketches and notes show how the second prototype will be different and improved*
- *Organise the folders and use specialist terms appropriately and correctly.*

A515 Sustainability and technical aspects of designing and making

General Comments:

It was pleasing to see that there were only a small number of 'no response' answers which were linked to specific questions. Similarly, there were very few candidates who failed to complete the paper fully. The number of candidates failing to complete the paper and the number of 'no response' answers continues to reduce year on year.

It is important to stress that questions must be read fully before an attempt is made to respond. This is particularly important with the '*' questions which test the quality of written communication. If the question is misinterpreted a lot of marks can be lost. There were very few instances of 'bullet point' lists or repeated points within these questions this year which was pleasing. This year again there were a significant number of candidates who repeated the question stem at length as part of their answer, especially on the '6 mark' written responses. Candidates may have been told to try and fill the space, but it should be understood that there are never any marks awarded for repeating the initial question as part of an answer on any of the questions on the paper.

Where a question requires candidates to sketch as part of their response, those candidates who were most successful made full use of the space available so that sketches were clear. It is important that candidates use clear annotation and provide sufficient detail in their sketch(s) and annotation to allow the examiner to give credit for the understanding shown.

It is also important that candidates take care to ensure their answers are legible to the Examiner, and that they do not put themselves at a disadvantage because the response could not be read.

If candidates use the additional space at the back of the paper or in a space not intended for a response to all or part of a question, it is vital that the response is clearly labelled with the question and part number. It is also a good idea to put a note in the correct response space for the question part indicating to the examiner where the additional work has been carried out.

Candidates demonstrated through their answers in Section A, a good general knowledge and understanding of sustainability issues and the application of the six R's.

Knowledge of commercial practice continues to be an area of weakness demonstrated by many candidates through their answers, this knowledge can best be gained from the disassembly of electronic products. Candidates who had carried out this type of work were clearly better equipped to answer the questions which covered design features and understanding of manufacturing techniques and casing construction.

Knowledge of certain components and their use in circuits continues to be an area of weakness. Candidates need to understand fully the use of all components as outlined in the relevant section of the course Specification

Comments on Individual Questions:

Section A

Questions 1-15 consisted of 1 mark responses and they were, generally, well answered with very few nil responses.

Q1 The majority of candidates answered this question correctly identifying that fitting thermal insulation glass to a house increases passive solar gain. Commonly, where candidates answered this question incorrectly they stated that it 'helps keep the loft warm'.

Q2 This question was well answered with most candidates identifying that assessing potential dangers in an electronics factory is called a risk assessment.

Q3 This question was well answered with most candidates identifying that approaching a problem differently is rethinking.

Q4 This question was well answered with most candidates identifying that eco-design is used when designing a product to make it as environmentally friendly as possible.

Q5 This question was well answered with most candidates identifying that reduce refers to using fewer materials.

Q6 Candidates demonstrated a good understanding of smart materials in general through their answers. It is important, however, that candidates read the question carefully to ensure that they answer what the questions is asking which in this case was to identify a smarter material that can shorten its length when electrically heated. Common correct answers included SMA and nitinol.

Q7 Candidates answers demonstrated a good understanding of the poisonous and harmful properties of lead and therefore why it should not be used in electronic products.

Q8 The majority of candidates were able to explain clearly the benefits of video-conferencing and how it can reduce your carbon footprint.

Q9 The majority of candidates were able to explain the meaning of the term 'sweatshop'. Where candidates failed to obtain the mark their answers lacked key words required by the mark scheme to distinguish between a more general factory and a sweatshop.

Q10 This question was well answered with candidates identifying a range of different plastics made from oil. Common answers included acrylic, PVC and polyester.

Q11 The majority of candidates identified that geothermal power generation does not contribute to global warming.

Q12 This question was well answered with candidates identifying that renewable energy sources are not in limited supply.

Q13 Whilst the majority of candidates correctly identified that CFCs do not improve the ozone layer, there were still a significant number of candidates who answered this incorrectly.

Q14 The majority of candidates understood that the Ethical Trading Initiative is global.

Q15 The majority of candidates knew that environmentally friendly packaging decomposes naturally.

Q16(a) This question was well answered with the majority of candidates gaining 3 marks and only a small minority failing to gain any marks. Common answers identified the on/off switch, volume control, the slot for the player to be held in and the foldability of the speakers all as features of the MP3 speaker unit. Where candidates failed to

gain credit their answers were too general and not linked to a specific design feature of the MP3 speaker unit.

Q16(b) The majority of candidates were able to identify at least one benefit of using the USB power source. Common answers related to batteries not being needed, or no issues with the disposal of batteries when they were spent. Candidates who achieved both marks went on to identify the increased availability of USB style chargers or the ability to charge the MP3 speakers from another device such as a computer or extender power pack.

Q16(c) This question was well answered with the majority of candidates awarded full marks.

Q16(d) Most candidates achieved at least 2 marks on this question. Those candidates who were most successful and obtained 3 or 4 marks made full use of the space available so that their sketches were clear. Importantly, these candidates often used more than one sketch to explain their design, and used clear annotation. Their response provided sufficient detail in their sketches and annotation to allow full credit to be awarded for the understanding shown.

Q16(e) Many candidates discussed general recycling and failed to read the question stem fully, and in doing so failed to respond to the focus of the question on secondary recycling. It is important that candidates read the question stem carefully to ensure they answer the question that is being asked giving them access to the full range of marks available. Candidates need to have knowledge of the different types of recycling and what they mean. Candidates who answered this question well gave specific examples of components that could be secondary recycled, these commonly included: LEDs, transistors, and IC's. Successful candidates identified that these components could be removed from products and reused in new products to reduce a products carbon footprint. They gave specific examples of how doing this could reduce the products carbon footprint such as reduction in energy required to produce the product, reduced transport costs for components and a reduction in new materials required to produce new components.

Section B

Q17(a)(i) Most candidates scored at least 1 mark on this question. Many candidates are not familiar with the process order for soldering in particular the need to 'tin the soldering iron' before soldering, and the importance of allowing the heat to conduct before feeding the solder onto the joint.

Q17(a)(ii) Only a small number of candidates answered correctly the meaning of a 'dry' solder joint. Common answers described poor soldering technique rather than giving a definition of a 'dry' joint which is different.

Q17(a)(iii) Most candidates identified the use of visual inspection to identify a dry joint, candidates awarded both marks commonly suggested the use of a multimeter as a second way of identify the problem.

Q17(b)(i) It is important that candidates have an understanding of COSHH and answers to this question suggested that many candidates were not clear about this legislation and its purpose. Common correct answers to this question referred to the use of ventilation and providing appropriate PPE.

Q17(b)(ii) Again it is important that candidates read the question carefully before answering. Many candidates talked about general safety precautions that should be taken when using a soldering iron. Answers needed to refer to 'electrical' safety precautions with

acceptable answers generally referring to checking the cable for burn marks / exposed wires.

Q17(b)(iii) There was a good understanding of the heat conducting qualities of copper with most candidates gaining a mark on this question. Understanding of the other reasons for using electro-plated copper was more limited although a small number of candidates identified that the electro-plating protected the copper oxidisation.

Q17(c)(i) Most candidates achieved at least 1 mark on this question with common answers identifying the reduced assembly time/cost when compared to using discrete components. It is important that candidates are familiar with modular units as an alternative to using individual components, candidates' responses suggested that this was not always the case.

Q17(c)(ii) Most candidates gained at least 1 mark on this question. Common answers included the footprint of the modular unit on the board, the wiring connections and the operating voltage.

Q18(a) Very few candidates answered this question well. Candidates need to ensure they read the question fully to ensure their responses answer the actual question. It is important that through experiences during the course that candidates have the opportunity to become familiar with a variety of methods to fix a PCB in a casing and how these work.

Q18(b)(i) Where candidates gained marks on this question it was for understanding the possible movement of the cable and therefore the need for multicore wire. Some candidates identified the need for heat resistance or the colour coding of connections.

Q18(b)(ii) Candidates need to be familiar with methods of strain relief when fitting wires to a PCB. Many candidates suggesting threading holes on the board for the wires but then drew them the wrong way round so that the wires were not being soldered to the track side of the PCB.

Q18(b)(iii) Most candidates achieved 1 or more marks for this question. Generally, they tended to identify the ease of removal of method A, the ability to connect and disconnect the wires quickly for method B and the low profile of method C.

Q18(c) Candidates answers were largely well written with clear use of punctuation, spelling and grammar. It is important that candidates read the question stem carefully to ensure they answer the question with what is being asked, therefore giving them access to the full range of marks available. The question asked specifically about printed circuit board manufacture using CAD and CAM; however, many candidates talked more generally about circuit design so did not gain credit for this. Candidates accessing the Level 3 band commonly talked about the ease of editing tracks and pads, the ability to autoroute and the portability of designs electronically between designer and manufacturer.

Q19(a)(i) Many candidates correctly identified the NOR logic gate in the circuit diagram.

Q19(a)(ii) Many candidates correctly identified the logic level as 'high' at point X in the circuit.

Q19(a)(iii) Candidates need to be familiar with the use and purpose of 'pull down' and 'pull up' resistors in circuits. Very few candidates were able to access marks on this question.

Q19(b)(i) Candidates need to be familiar with rearranging formula and conversion of units when substituting values into a given formula. Many candidates accessed some of the available marks through correct substitution into the formula, however, most then failed to convert the units for the capacitor giving them an incorrect final answer.

Q19(b)(ii) A small number of candidates successfully drew a 5 second duration square pulse. Some of these then used the correct amplitude of +9V to gain the second mark.

Q19(c)(i) Successful candidates identified the use of the spring to return the latch to the locked position once the coil had been released.

Q19(c)(ii) Common responses by candidates explained using notes and sketches how to drill and file the slotted holes. Many candidates identified that this could also be done through milling or the use of a punch tool. Candidates need to be mindful of giving responses linked to CAM without sufficient notes explaining exactly how to do this to create the required outcome.

Q19(d) Most candidates correctly linked pins 1-3 to the monostable output Y. Candidates need to ensure they are familiar with the numbering conventions on IC's as many candidates labelled pins 10-12 as pins 16-18. There was limited understanding of how to connect up the solenoid correctly.

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